Synthesis, characterization and thermal polymerization of new 3,4-dihydro-2H-1,3-naphthoxazine monomers

ABSTRACT

Two new 1,3-naphthoxazine monomers (M-A and M-B) were synthesized via a modified stepwise procedure in which methylene bromide was used for the ring-closure reaction. Condensation of 2-hydroxy-1-naphthaldehyde with 1,6-hexamethylenediamine or 1,4-phenylenediamine gives imine compounds, which were converted to 2-hydroxynaphthylamines by reduction with NaBH4 in methanol. Ring-closure reaction between the 2-hydroxynaphthylamines and methylene bromide results in the formation of 1,3-naphthoxazine monomers M-A or M-B with good yields. The structures of the synthesized monomers were confirmed using different spectroscopic techniques (including FT-IR, H-1 NMR and C-13 NMR), mass spectrometry, and elemental analysis. Thermal polymerization of the monomers was investigated by FT-IR and differential scanning calorimetry (DSC). Both the 1,3-naphthoxazine monomers undergo ring-opening polymerization, leading to the formation of the corresponding polynaphthoxazines [P(M-A) and P(M-B)]. The thermal stability of the polynaphthoxazines was thereafter studied by thermogravimetric analysis (TGA).

Keyword: 1,3-naphthoxazine; Polynaphthoxazine; Thermal polymerization; Thermal properties